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SPECIAL ISSUE!



- Inside -

Portuguese Timex Computer & Disk Drive System — A Review!

The Rotronics Wafadrive — An Alternative to Cassette

Converting Your Color TV to a Color Monitor

PUBLISHER'S STATEMENT

— For New Readers and Old

For a number of our readers, this is your first issue of SUM Magazine. Others have been with us since we were only a local users newsletter, supporting the Timex Users Group here in Gainesville.

SUM Magazine is the result of the efforts of Joe Williamson and me, Richard Cravy, to help support our "orphan" computers. As a result of several small publishers and dozens of small software and hardware businesses across the U.S., not only are the Timex computers being supported, they are thriving. For those who

do not already know, there is more hardware and software now than there ever was when Timex was in the business! We are glad to be a small part in this success.

In SUM Magazine we try to offer a place for entrepreneurs to advertise, and owners to share their discoveries with others. In addition, we try to provide a good mix of news, hardware construction, software programming, and hardware and software reviews. Though we appreciate the help that some companies have given us by advertising or providing review copies, we honestly try to be unbiased in our evaluations, thinking only of whether we would consider purchasing and using a product ourselves. Our opinion may not be the same as others, or the same as the manufacturer — but it is how we honestly feel.

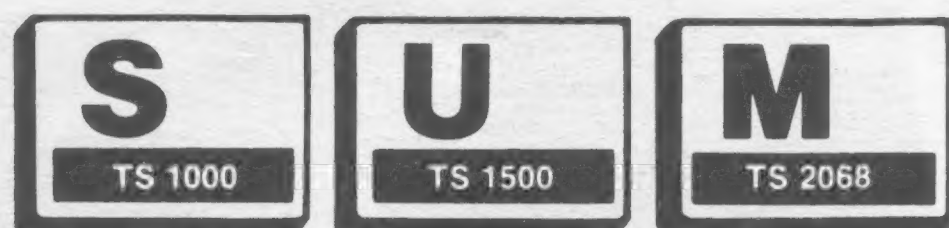
Joe has brought to this task a just completed degree in Electrical Engineering at the University of Florida (Go Gators!) and experience with Sinclair dating back to his purchase and construction of a ZX81 kit.

I have now, have access to, or have owned in the past, numerous computers including IBM PCs, Apple, TRS-80, Sanyo, and Kaypro. My favorite for all around fun, and sincere respect for its engineering genius is, of course, the Timex/Sinclair line.

Growth of SUM since we formally began an active subscription drive last August has been more than we had hoped for. We add new subscribers daily, currently mail to 650+ Timex users and users groups. Some new (and expensive) advertising we are just beginning will generate many more subscribers, and you may be in that number.

Plans for the future are these: MORE OF THE SAME, ONLY BETTER! We hope to keep a 50/50 ratio between advertising and editorial content (by page count), but up the amount of editorial material by using smaller type, and eventually switching over to commercial typesetting. As you've noticed, we are a MONTHLY. We think this distinguishes us, for the present, from all other major Timex/Sinclair magazines here in the U.S. Presently we are either the lowest or among the lowest in subscription price and advertising. We hope to keep it that way! This is not a slam against other publishers, for we know that

...continued on page 27



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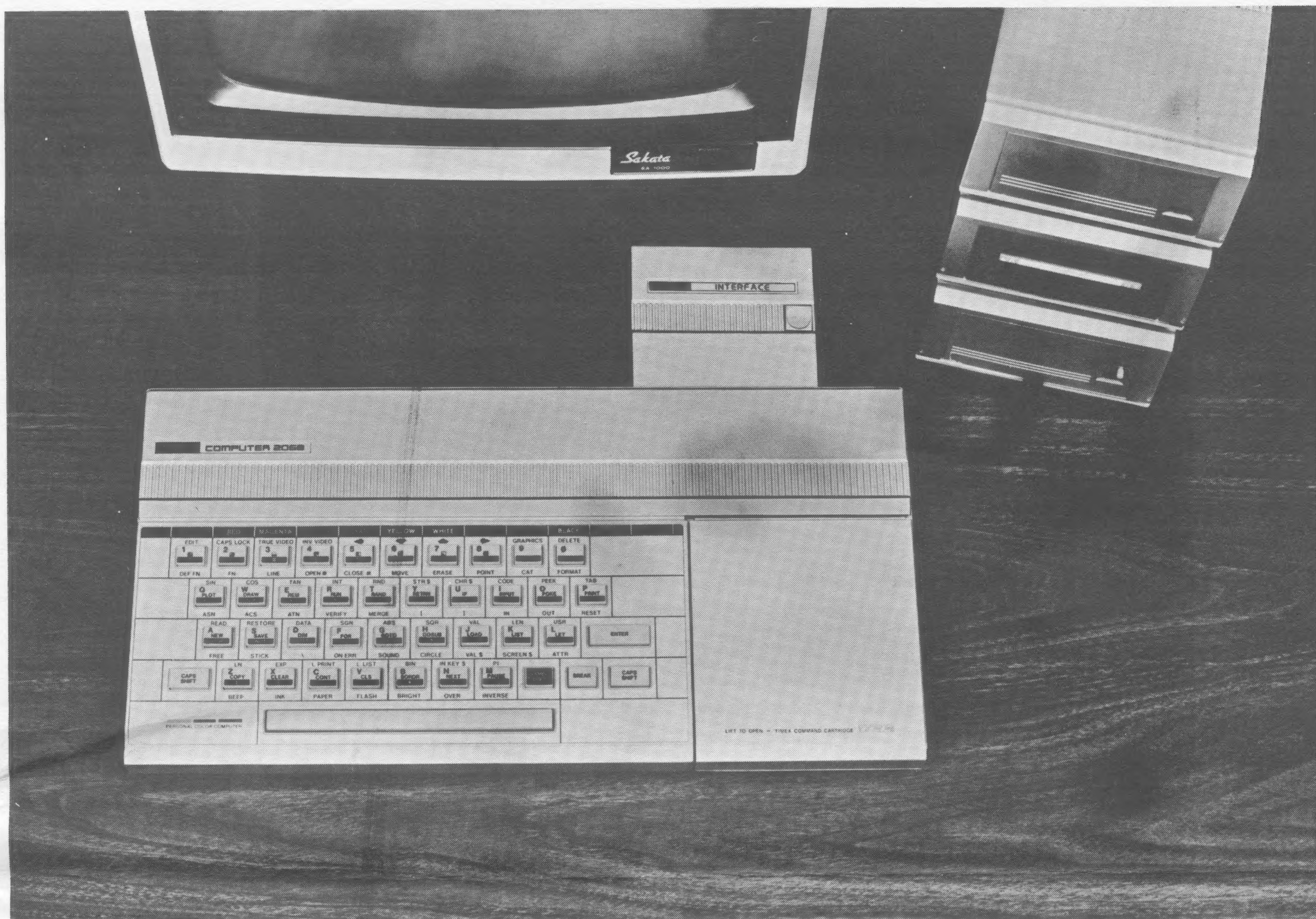
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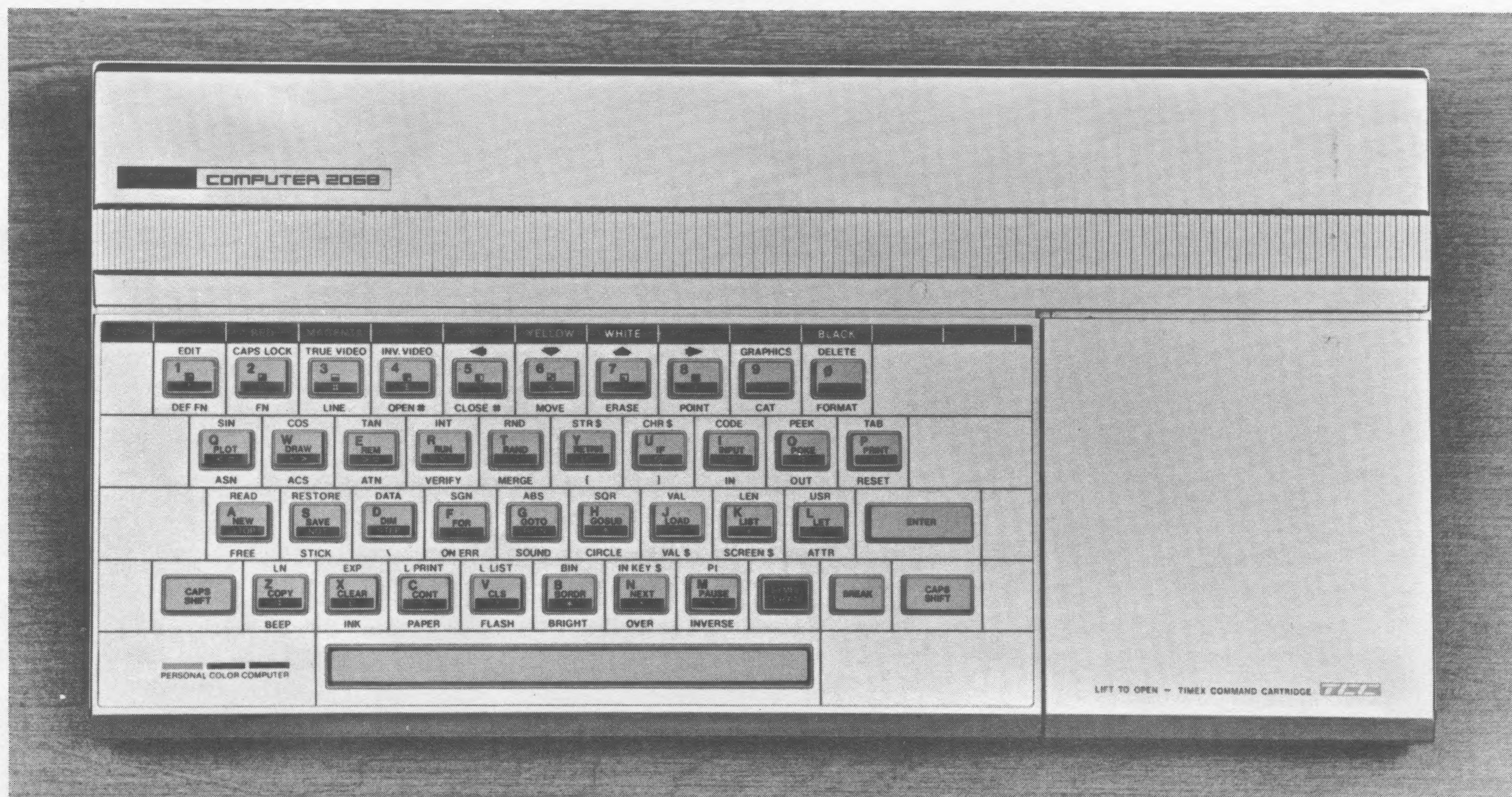
Portuguese Timex T-2068 Computer & Timex Disk Drive System: *A Hands-On Evaluation*

Timex is still in the home computer market--in Europe! When Timex bowed out here in early 1984, their computer manufacturing facilities in Portugal continued their work, primarily, so everyone believed, manufacturing for Sinclair in England. Apparently, this was only partly true. Their research and development department was still at work, perfecting the products only hinted at before Timex bowed out.

This issue of SUM is partly devoted to reviews of these new products. It is our understanding that Timex in Portugal is currently selling the computer in Portugal, and has the disk drive system for

sale in both England (for the Spectrum) and in Portugal. We do not presently have any undisputed indication that they will come to the American market. There is also no connection with the coming QL computer from Sinclair.

Through the courtesy of Timex in Portugal and the invaluable help and persistence of Bob Dyl of English Micro Connection in Newport, Rhode Island, SUM has been able to acquire the following computer equipment for evaluation: a Timex single disk drive system, a new version of the Timex 2068 computer, and a Timex Emulator Cartridge. None of these products are presently for sale in the U.S. They



The keyboard looks the same, except for the name in the upper left corner. The real differences lie inside.

are expected in the future. More details will given further on in this article.

THE HARDWARE

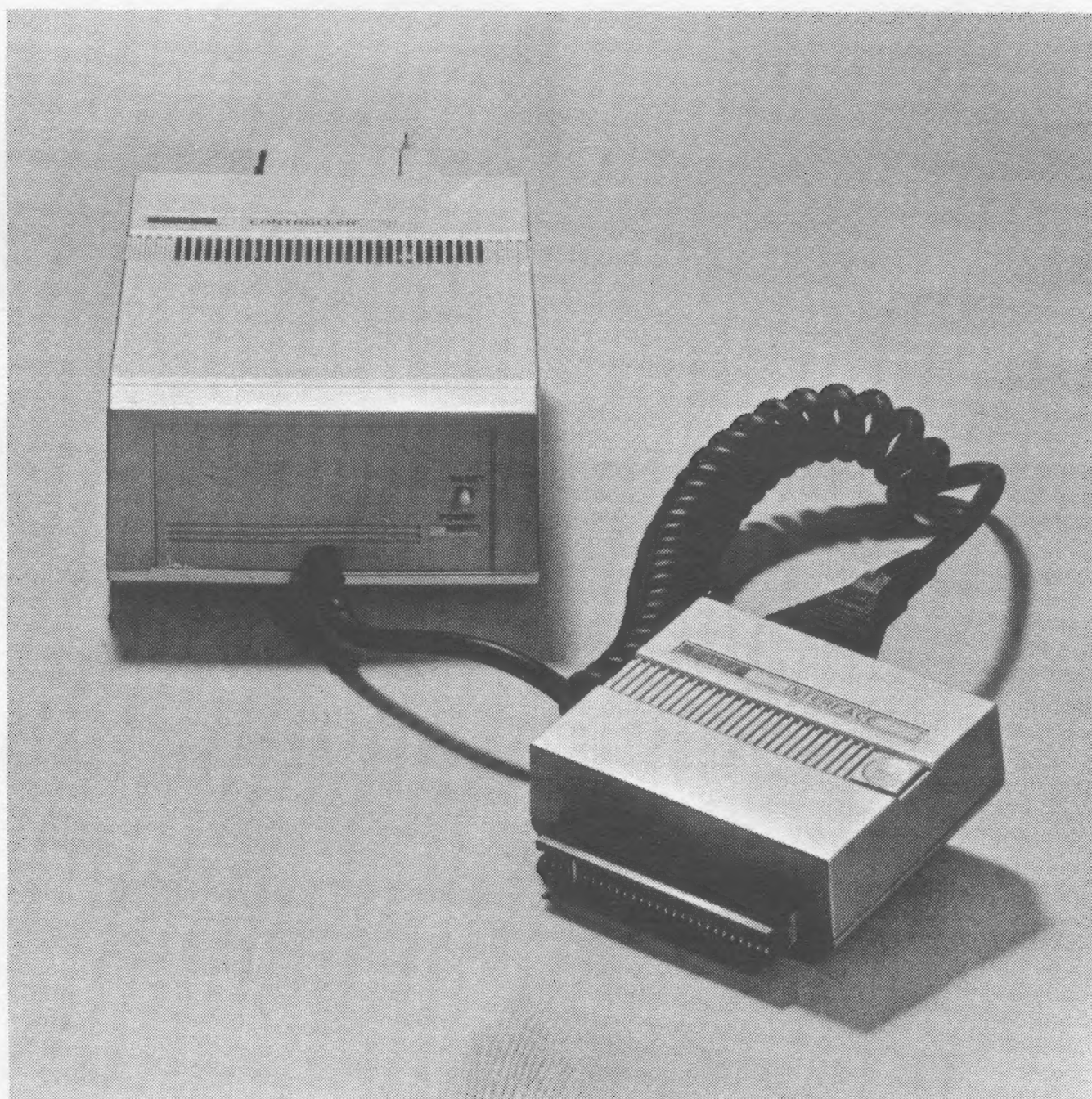
The Timex 2068 computer appears to be a Timex/Sinclair 2068 with only the name in the upper left corner changed. I say, "appears" because, in fact, it is a different computer in several ways. First is the fact that the rear edge connector is not TS-2068 compatible; it is a Sinclair Spectrum pin-out. Shipped with the computer is one of Timex's small plug-in cartridges (goes under the Timex Command Cartridge door on the right hand side of the computer) which makes the Timex 2068 highly compatible with the Spectrum when it is plugged in. When removed, the T-2068 runs TS-2068 software.



Visions of running the Emulator cartridge on my TS-2068 ran through my head as well, but investigation shows that the emulator cartridge has been made tall enough that it won't fit into the slot of the American machine; it's just as well as it turns out, since the Emulator does not work with American machines.

The case and keyboard are identical other than the taller slot for the Emulator cartridge. Opening the Portuguese computer also reveals major differences. The circuit board is much smaller, and is dominated by a few large scale integrated circuits which must incorporate many of the discreet resistors and capacitors and other parts on the American machine. The RF modulator is of a different design, and the output on our monitors and television was much "cleaner" and steady. The one machine we tested did seem to have a slightly weaker output signal on the monitor than the TS-2068. The Portuguese computer uses a 9 volt power supply instead of the 15 volt sold in America.

The disk drive system consists of three identical sized boxes approximately 5" wide by 6 1/4" deep by 2 3/4" tall. They contain the power supply, disk controller, and disk drive. In addition, the appropriate interface is provided which plugs into the rear of the computer. Three versions of the interface are said to exist,



Disk drive controller box and plug-in interface

two of which we tested. Versions for the Spectrum and the Portuguese T-2068 we ran through their paces. We have not seen the interface that adapts the drive system to the American TS-2068. Various cables also protrude from the three boxes connecting the power supply to the controller and drive. Another cable from the rear of the controller box connects to the disk drive. A second coiled cable comes from the front of the controller and plugs into the interface.

Having the drive system spread out over three boxes and an interface is a mixed blessing. The snarl of cables keeps things untidy looking in the back, accentuated if you are also using one or both of the RS-232 interfaces on the back of the controller box. They are also a bother to pick up and move. On the other hand, being small and separate gives you some variety in how you place them, though the cables which run between the boxes won't allow them to be separated by too much. They can be stacked on top of each other or set up on a shelf to leave more room on your desk top.

One real problem is the lack of any access to the rear edge connector when the interface is plugged in. This means, in my case, that I cannot run my printer with the disk drive since my printer has a centronics parallel interface. Unless you purchase a Y-connector, a serial-to-parallel converter, or a serial printer, you

will have the same problem. (An exception to this is Joe Williamson's Foote Print printer interface which plugs into the cartridge slot of the TS-2068.)

UP AND RUNNING

The disk system connects up easily, but first time users may be a little unsure of themselves since the manual has no diagram or picture to accompany the written instructions. When powering up, the computer is turned on first. Then the power switch on the back of the disk power supply is flipped on. A prominent red light shows on the disk drive unit indicating its readiness. A 3" microfloppy comes with the system. It contains the disk operating system designated T.O.S. (Timex Operating System) and is self booting (loading) when slipped into the drive slot.

When the disk is inserted, the red light flickers off and on why the quiet drive loads the TOS. When booting is completed, the light goes off, indicating both that the operation is complete and



How the disk drive system stacks up

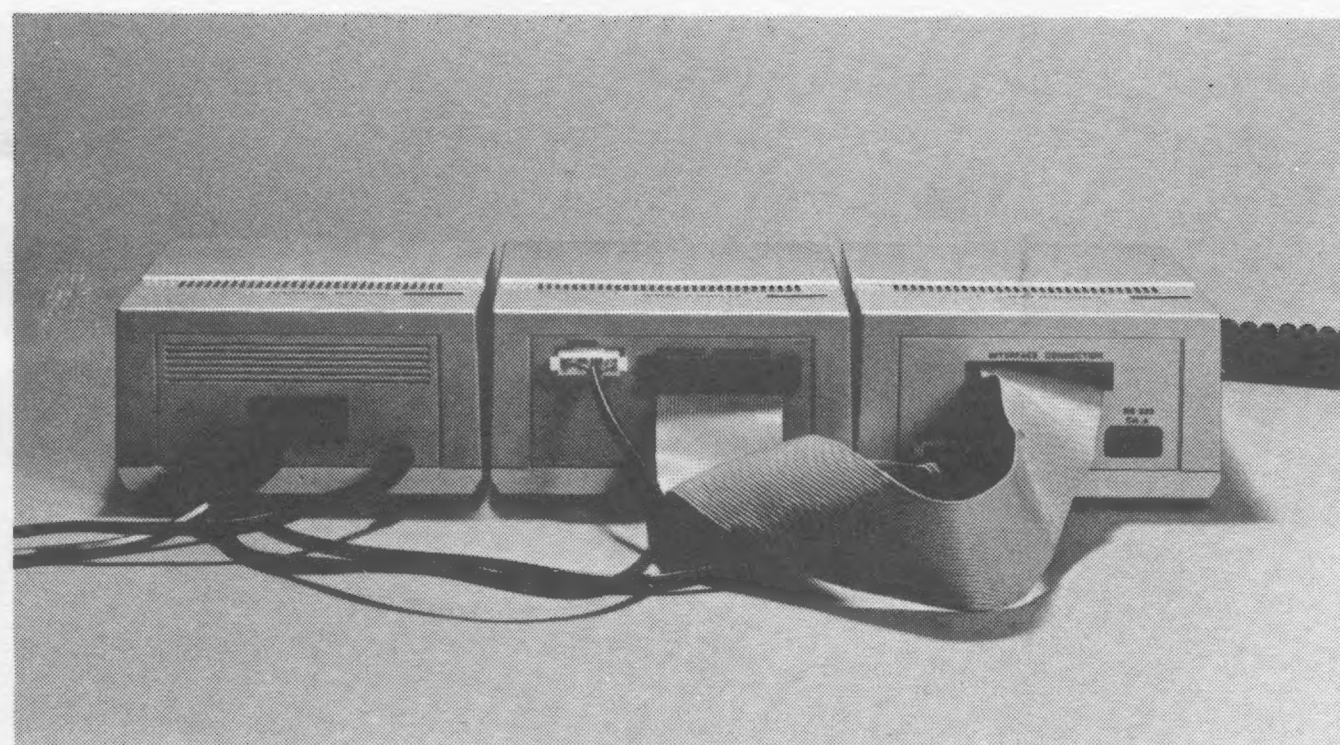
that it is now safe to remove the diskette if another one is to be used. The diskette itself is enclosed in a rigid plastic case and has a metal shutter covering all openings in to the magnetic surface. This shutter slides out of the way when the disk is inserted in the drive and closes as it is removed.

The disk drive is a Hitachi unit which is a wonder of miniaturization. This same drive was offered for a while in the U.S. but never caught on, losing out to the Sony drives used on the Apple Macintosh, Hewlett-Packard, and other computers. But it does seem to be quite popular in Europe as I see it advertised either available for or actually being used with a number of different computers there. TOS can handle up to 4 drives, though cabling is only supplied for two, and an extra power supply would be necessary. The drive is a single-sided (SS) model meaning it has one read/write head and operates on one side of the diskette. However, the diskettes can be turned over and the second side used.

Maximum storage capacity of the diskettes is 160k per side, or 320k each. When the operating system is saved on a disk, it leaves 140k of useable space on a side.

Access time, saving, and loading are fast. I was able to save everything thing in the memory of the 2068, from address 0 to Ramtop--64k--in 32 seconds. That comes to 2k per second. Saving Tasword II on to disk was simple, practically identical to saving it onto the A & J Microdrives as detailed in the April issue of SUM. For comparison, loading Tasword II off cassette takes about 105 seconds, off A & J Microdrive about 25 seconds (once it finds the beginning of the file), and off the Timex disk drive about 7 seconds!

After the TOS diskette boots up, there is no immediate indication that TOS is in place. However, the CAT* command will bring the drive briefly to life and a directory of all files available on the current diskette will be displayed on the screen. Saving and loading files is accomplished as with a cassette except the command must be followed by an asterisk (symbol-shift B). In fact all instructions to the disk drive must contain the asterisk or they will either look for cassette or send the system off to "never never land". When the computer does "go away", a reset button on the interface allows a "warm boot" of the system--that is, you can



Behind the scenes, the inevitable tangle of cables

break in a reset the system without using the power switch.

SECRETS OF THE OPERATING SYSTEM

The following commands are supported by TOS, all on the 2068 keyboard: ATTR*, CAT*, CLOSE**, MOVE*, DIM*, ERASE*, FORMAT*, GO SUB*, GO TO*, INPUT*, LIST*, LOAD*, MERGE*, LET*, OPEN*, PRINT*, DRAW*, and SAVE*. An accompanying article details exactly what each command does.

The TOS is quite adequately explained in the manual accompanying the system. It consists of a 70 page 5 1/2" by 8" book. There are no photos or drawings in the manual and only one diagram (reproduced below). The original was produced on a dot matrix printer then offset printed. In spite of this, the text is quite readable. The book is divided into seven sections:

1. Introduction
2. Setting Up
3. TOS, Part I -- basic commands
4. TOS, Part II -- working with directories and Pathnames
5. Random Access and Sequential Files
6. Serial Communication Ports
7. Appendices
 - A. TOS Command Summary
 - B. Error Reports
 - C. Utility Programs
 - D. RS232C Link Ups
 - E. Error Trapping
 - F. Machine Code Tips

The main two failings of the manual are the lack of illustrations to make things easier, and the lack of an index which would greatly simplify locating just the information you need.

The manual is easy to read, and goes a good job of explaining several rather complex subjects, such as directories and pathnames. Further, it has several simple

TIMEX OPERATING SYSTEM (TOS) Commands

Here is a brief description of each one of the extended BASIC instructions provided by TOS. Each command is on the TS-2068 keyboard.

ATTR* -- must be followed by pathname and P or U or I or V. Protects or Unprotects a file (P or U) and makes it invisible or visible (I or V) to the CAT* command.

CAT* -- optionally followed by pathname to list on screen information on all the files and subdirectories defined in the current or pathname directory.

CLOSE** -- must be followed by channel number between 1 and 16. Closes a file that was accessed after updating changes made while the channel was open.

MOVE* source pathname TO destination pathname -- Copies a source file to a destination file without destroying the source file.

DIM* -- must be followed by a pathname. Creates a file with the name specified, or a new directory if ".DIR" is appended to the pathname.

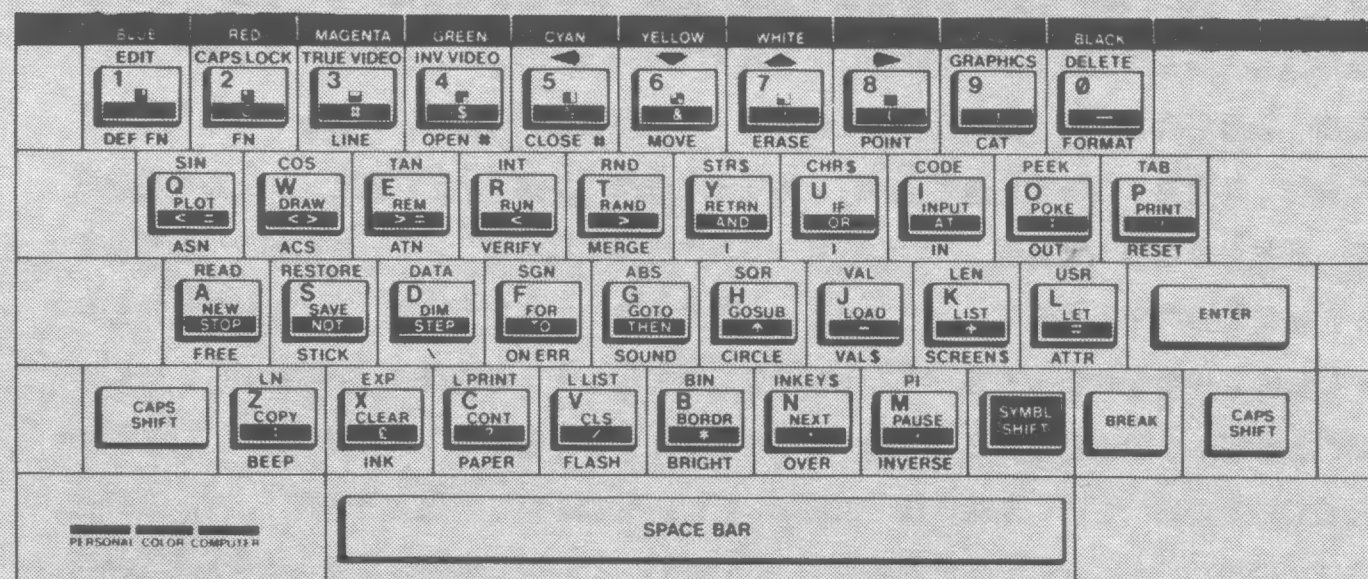
ERASE* -- must be followed by a pathname. Erases the file specified. Will generate an "Erase pathname (Y/N)?" for confirmation.

FORMAT* drive name TO disk name -- formats diskette not write protected by red tab on diskette. Erases all files on one side of diskette, places a copy of TOS on it, and names one side of diskette.

GO SUB* -- must be followed by pathname. Saves the current directory, accesses the specified directory or file, allows execution of whatever instructions are needed and returns to original file or directory when a DRAW* is encountered. Functions like GO SUB/RETURN.

GO TO* -- must be followed by pathname or drive name. Changes the current directory to that designated by the pathname. Works similar to GO TO in BASIC.

INPUT* -- must be followed by channel #. Reads a record from a file. Record number may be specified allowing random access to file records.



LIST* -- lists information on the current directory and on all directories stored in the stack. Information listed includes the pathname of the current directory, its level, and the drive being accessed.

When used with a channel number, lists extensive information about the channel open to a file including channel type, mode (input, output, random access or append), record length, current record, and file size.

LOAD* -- must specify pathname. Cannot load a directory; must specify any extensions such as ".BAS" or generates error report.

MERGE* -- must specify pathname. Merges a disk BASIC program and a program in the computer's memory.

LET* old pathname TO new pathname-- allows renaming a file.

OPEN** channel number; pathname; mode -- opens a file and associates a channel number with it. Also specifies mode and optionally gives record length. Modes are input (i), output (o), random access (r), append (a).

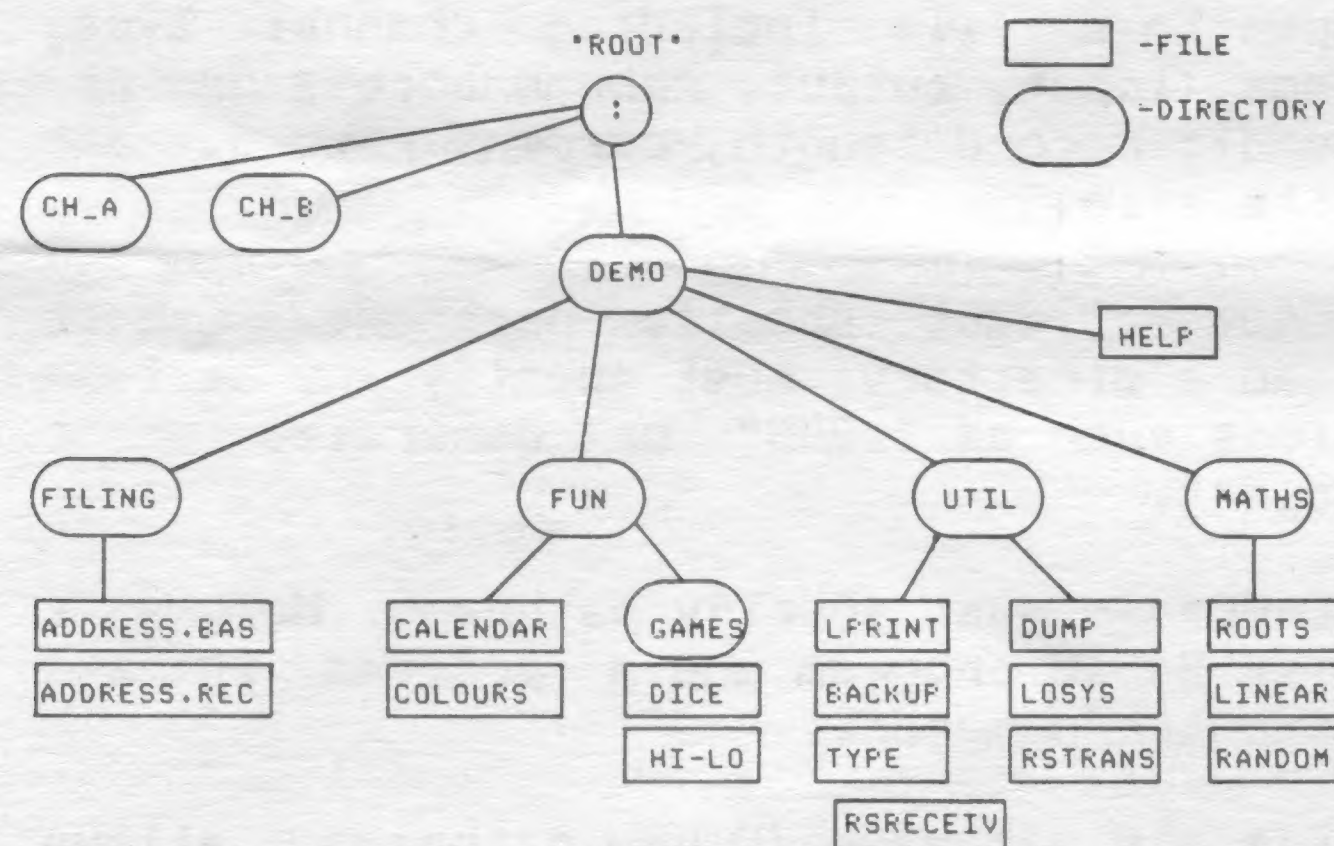
PRINT* -- writes to a file or serial port using the specified channel number.

DRAW* -- is used with the GO SUB* command.

SAVE* -- specify pathname. Used similarly to SAVE in cassette BASIC. If file name already exists on that diskette, will prompt that "Filename already exists" and asks if you wish to overwrite current file.

programs at appropriate places which really should be typed in by the beginner as they illustrate very well the intended point.

In order to understand how to use and get around in TOS, it is necessary to know about DIRECTORIES, PATHNAMES, and TREES. The opening directory (obtained by CAT*) when the operating system is first loaded is called the "Root Directory". The Root Directory may list both files (whether programs, data files, etc.) and subdirectories leading to other files. These directories in turn may contain other files and/or directories. When the whole filing structure of a diskette is considered it is called a TREE. Describing the path from the Root Directory down to the particular file you wish to access is called the PATH NAME. The accompanying diagram taken from the TOS manual illustrates this concept very well. The diagram is a map of the contents of Side A of the Operating System Disk which comes with the disk system.



Such a "hierarchic" structure allows an orderly arranging of files. Note in the diagram that Utilities are all under one directory, Maths under another, and Fun under a third.

When the disk is first booted, a CAT* will yield the following:

```
:DEMO
Level 0 Drive A
```

Name	Typ	Size	Alloc	S	P
HELP	BAS	11087	11k		P
MATHS	DIR	3187	4K		P
FUN	DIR	6651	9K		P
UTIL	DIR	3075	7K		P
FILING	DIR	1070	2K		P
MAX 140K CUR 33K REM 107K					
0 OK, 0:1					

Compare this to the diagram. The Directory being viewed is designated first preceded by a colon, that is ":DEMO". This is at "Level 0". One Basic program, "HELP.BAS", can be accessed, or four directories.

HELP.BAS may be loaded with LOAD* but entrance to the directories is possible using the CAT* (pathname) or GO TO* (pathname). An example (using diagram) would be accessing "DICE" by entering GO TO*":DEMO:FUN:GAMES". Calling for CAT* would now show "Level 2" and only two listings in the :GAMES directory. A total of 16 directories can be created and maintained on one side of a diskette. These can be arranged in practically any way including as directories inside other directories. In the diagram, 9 directories exist.

Files within directories are allocated a minimum of 1k of disk space. File names can be up to 8 characters plus a dot and a 3 character extension. All of the following are examples of legal file names:

```
A
CALENDAR.BAS
CALENDAR.COD
DICE
```

All file names are automatically converted to upper case characters. TOS automatically assigns ".DIR" to directory names and ".SCP" to serial communication port files. Looking at the listing above for the directory of :DEMO, there are 2 columns on the right side labelled S and P. If a file is open at the time a directory is called for, an "O" will appear in the S column. Since up to 16 files may be open at once for reading and/or writing from, this column shows which are open and closed at any given time. The P column shows if a file is protected. Protected files cannot be erased (except by FORMAT*) or written to, only read from. Files are protected or unprotected using the ATTR* command. This command also allows files to be created which are invisible to the CAT* command.

Though this overview does not do justice to the TOS, I am convinced that once this system is available to serious software producers, the Timex/Spectrum community will see business software far more powerful than anything possible today. By using the power of TOS to automatically open, close, read, write, append, and create up to 16 different files at once, powerful databases and complex management programs similar to those available to IBM PC users is possible. I use an IBM PC with

its PC-DOS and was immediately struck when I read the TOS manual by its similarity to PC-DOS while being easier to use!

An extensive list of 65 error messages is used by the system. Each is clearly explained in an appendix of the manual. They are quite specific and allow a quick diagnosis of mistake was made.

At present, four utility programs exist on the TOS diskette: BACKUP, LOSYS, DUMP, and LPRINT. BACKUP allows the copying of an entire diskette, sector by sector, to another diskette, even if only one drive is available. LOSYS allows updating to new versions of the operating system as they become available without loss of data on current diskettes. Each diskette has a version of TOS written to it when it is formatted. DUMP will dump the chosen file onto the screen, giving the hexadecimal bytes for each address and the ASCII equivalent. LPRINT activates serial port A on the back of the controller box so that the BASIC commands LPRINT and LLIST will drive a serial printer.

I had no way to check the functioning or uses of the two serial ports. The TOS manual provides several pages of information concerning opening and closing channels, transmitting and receiving data, connecting two Spectrums or T-2068s together and communicating, etc. It is very fascinating and the manual makes it sound very easy.

Two final appendices in the manual explain the use of error trapping and using TOS in machine code routines. Error trapping uses two otherwise unused system variables in the Spectrum and Timex: SYSERR and TRAP. The machine code tips detail accessing the TOS ROM without crashing the

system. Those users who understand machine code programming will find these 3 pages of great value.

CONCLUSIONS

The Timex Disk Drive System and TOS may be the vehicle that can carry both the Spectrum in England and the 2068 in the U.S.A. on to their rightful place as standards in the small computer field. I cannot imagine any device, peripheral, or software that Timex or Sinclair could have introduced for these machines that could have a greater impact for good than this system. Once a user has worked with this disk system for 30 minutes, I do not believe he/she will truly be happy with anything less!

The system provides for a great deal of expansion. A notice on the bottom of the controller box, and mentions in the literature Timex shipped with the system, show that CP/M is already able to run on this setup with the addition of 48k more of RAM in the controller box. CP/M is the most popular operating system for 8 bit business computers and has thousands of programs written for use with it.

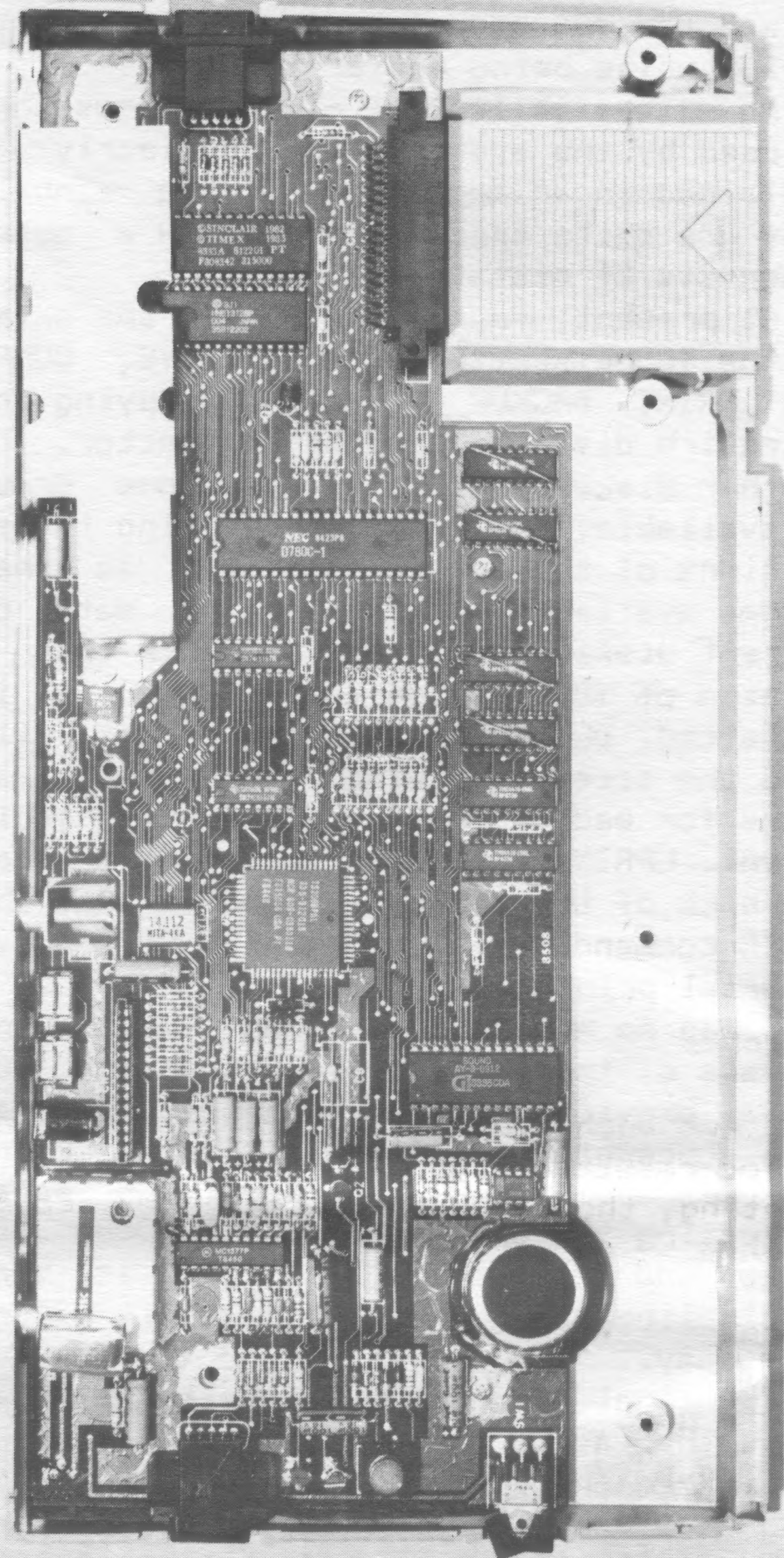
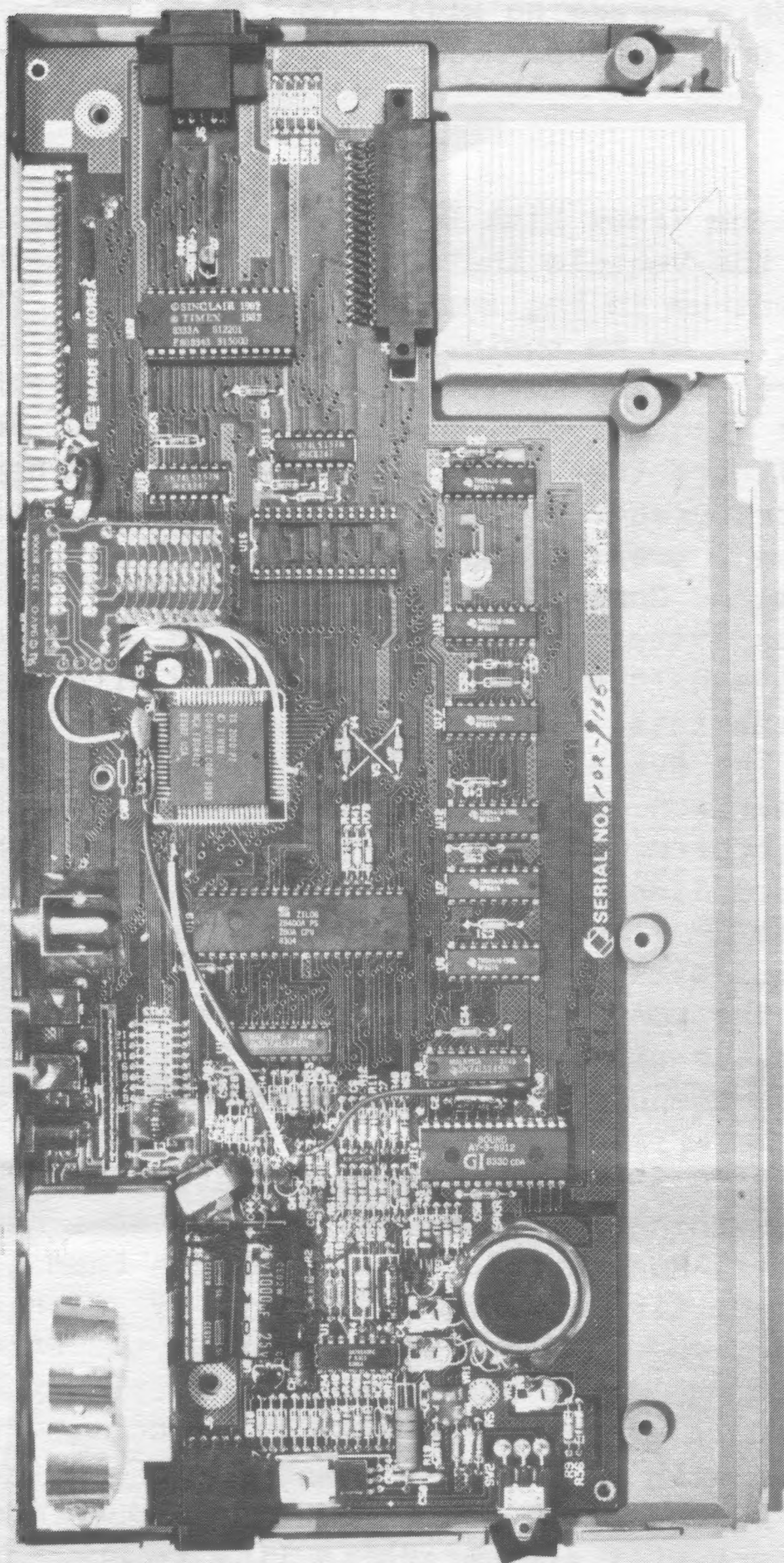
Here at SUM Magazine we have some of everything--Microdrives, Wafadrives, cassette, ROM cartridges--and we use them all at one time or another. It is my opinion that, should Timex ever decide to bring this system to market here, and it works as well as our Portuguese model does, not only will 2068 owners stand in long lines to purchase a system, but previous non-owners will also stand in line to purchase BOTH the computer AND the drive system!

-- Richard Cravy

Additional Notes on the Hardware of the T-2068 & Disk Drive

Disassembling the T-2068 reveals a circuit board smaller than found in the American computer. It is a very professionally designed board with no wire jumpers. A stand alone RF modulator replaces the video/RF modulator circuitry of the TS-2068. There are no trim pots or adjustable components except for a fine tune in the RF modulator. By comparison, the TS-2068 has five adjustable components.

The integrated chip count is down to 14 from 18 in the TS-2068, and none are socketed. Gone are the ICs which buffer the address and control lines; gone is the switching regulator IC, replaced by a 5 volt regulator and a very large heat sink as found in the Spectrum+. The speaker has a new chip driving it, the popular LM 386, and the sound is louder. The SCLD chip looks the same but following the circuit



Side-by-side comparison of the TS-2068 (left) and Portuguese T-2068 main circuit boards

board traces indicates that it is probably different--bad news for owners who might have wanted to swap theirs for this one.

The rest of the components on the computer circuit board are about the same and in the same general location with the exception of the 5 volt regulator and the Z-80 cpu. The ear and mic jacks are like those on the TS-1000 and Spectrum series; they are not as sturdy but work fine. The keyboard has more spring and fewer dead spots than the TS-2068. The circuit board itself is stamped "Timex 2068A"; compare this to my TS-2068 which says "Timex TS 2000". The boards seems to be one model behind the machines they are in!

The big question is how compatible is the new T-2068 with the English Spectrum and the American TS-2068. The answer is: VERY! I was able to run M-Script with its 64 column mode as well as Musicola and Cyberzone and the computer ran like a TS-2068. Next I inserted the Spectrum Emulator cartridge that comes with the T-2068 and loaded all the Spectrum software I had. No problems! The emulator boots up differently than Doug Dewey's EMU 1. Doug's shows first the 2068 copyright and then switches to the Spectrum copyright. The T-2068 emulator boots directly to the Spectrum copyright notice.

What about hardware compatibility? The



In the middle is the Maxell 3" diskette. Other recording media include 5 1/4" diskette, ROM cartridge, Wafadrive cartridge, and regular cassette tape.

T-2068 has a Spectrum edge connector so should handle anything made for the Spectrum by using the emulator cartridge (Rotronics Wafadrive, Sinclair Interface I and II). The Timex 2040 printer works fine as does the 2050 modem and Tasman printer interface. The Aerco interface works fine on my printer, but may give problems since it looks for the RESET line, which is not in the same location on the T-2068 and Spectrum edge connectors. Since this line is for resetting your printer to begin printing, the same thing may be accomplished by simply turning off your printer and then back on before sending to it. The FootePrint interface described in SUM in the January thru March issues does well and so does the Timex 2020 tape recorder.

I believe the A & J Microdrive will work if a "twister board" is designed to make the edge connector look like the TS-2068.

In the May-June issue of LIST (Long Island Sinclair Timex Newsletter, P. O. Box 438, Centerport, NY 11721) Nazir Pashtoon also reviews the Portuguese T-2068. He has already figured out the rear edge connector pin-outs, specifically those which extend beyond the Spectrum (the T-2068 has more pins on its edge connector than the Spectrum, just like the TS-2068). EXROM, BE and RGB signals are still present on this new buss. Missing are RSCS, SPKR TAPE OUT, SOUND, IOA5, and EAR. Added is a stripped sync signal for an RGB monitor making a direct hook-up to an RGB monitor possible. Connecting the proper pins to my Sears RGB monitor gave beautiful results without having to make any extra circuits. Pashtoon's unit apparently was a rough pre-production unit as it had a "rigged"

color video circuit, extraneous bypass capacitors, and all its chips in sockets. Nazir did test the Sinclair microdrives on his model T-2068 and reported that they worked perfectly.

Opening all three of the system boxes shows clean, professionally designed and produced circuit boards. I only found one jumper wire.

The power supply is double-fused and well regulated. Our unit got a little hotter than I like, but did not affect its operation. It is necessary to always put it where it can get plenty of air circulation to prevent possible overheating.

Inside the disk controller I found a very familiar circuit board--the board from the TS-1016 RAM pack for the TS-1000! It still has the Sinclair logo and flat ribbon cable. The engineers were resourceful! The controller is basically a self-contained computer, having its own Z-80 cpu, memory (16k + 1k), and 1k ROM. For the two RS-232 ports on its backside, a UART (universal asynchronous receiver/transmitter) is used. A disk controller chip and a "mystery" ULA chip completes the board.

Having the on-board RAM means the controller does not take up any computer RAM. This enhances software compatibility and distinguishes it from the Rotronics Wafadrive, Sinclair Microdrive, and several disk drive systems available in England for the Spectrum. A label on the bottom of the controller refers to CP/M. Since only the ROM was socketed inside, perhaps it will be changed and extra memory added for CP/M compatibility later.

Inside the disk drive box is a Hitachi 3" drive. The disk unit is very sturdy and solid looking; I suspect it will be very reliable. A set of jumpers at the back of the drive allows configuring the drive as number 1, 2, 3, or 4 in a system.

The two interfaces supplied with our unit allowed us to run the disk drive system with both the Spectrum+ and the T-2068. A third interface is promised to allow the TS-2068 to also run the drive system. We were able to accomplish this by using a twister board modified according to Nazir Pashtoon's instructions in LIST and then plugging into the T-2068 interface. Voila! Disk drives on the American TS-2068!

-- Joe Williamson

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The Rotronics Wafadrive

An inexpensive alternative to cassettes

Those of us with ZX81s and TS1000s remember well the long and doubtful loading times of our original machines. To us, the TS2068 with its "fast" loading time was almost miraculous by comparison. But the new soon wore off, and we all cast our eyes longingly to Uncle Clive and the Sinclair Microdrives. Alas, they never got across the Atlantic before Timex bailed out.

In recent months we have at last begun to see our longings realized as microdrives, stringy floppies, and even disc drive systems have begun to make their appearance. This month we are going to look at the ROTRONICS WAFADRIVE SYSTEM. This system has been a big hit in England, where it was born, and is now available to 2068 owners with the aid of a Spectrum emulator.

The Wafadrive is to be distinguished in name from the A & J Microdrive and the Sinclair Microdrive. The Wafadrive has been nominated by the British Microcomputing Awards committee for "Peripheral of the Year" and was named "Product of the Year" by the Computer Trades Association in England. Many reviews I have read place it above the Sinclair Microdrive in performance and reliability.

The Rotronics Wafadrive consists of a black plastic box about 9 1/4" wide by 4 1/4" deep by 3" high. It has a short

interface cable and connector protruding from its front and three edge connectors visible in the rear. Two slots in the front near the top provide access to the wafadrives and three red LEDs between the two slots show power on and which drive is being accessed. The Wafadrive unit uses the same Entrepo stringy floppy tapes used by early A & J Model 2000 Microdrives (later models have a different drive and tape).

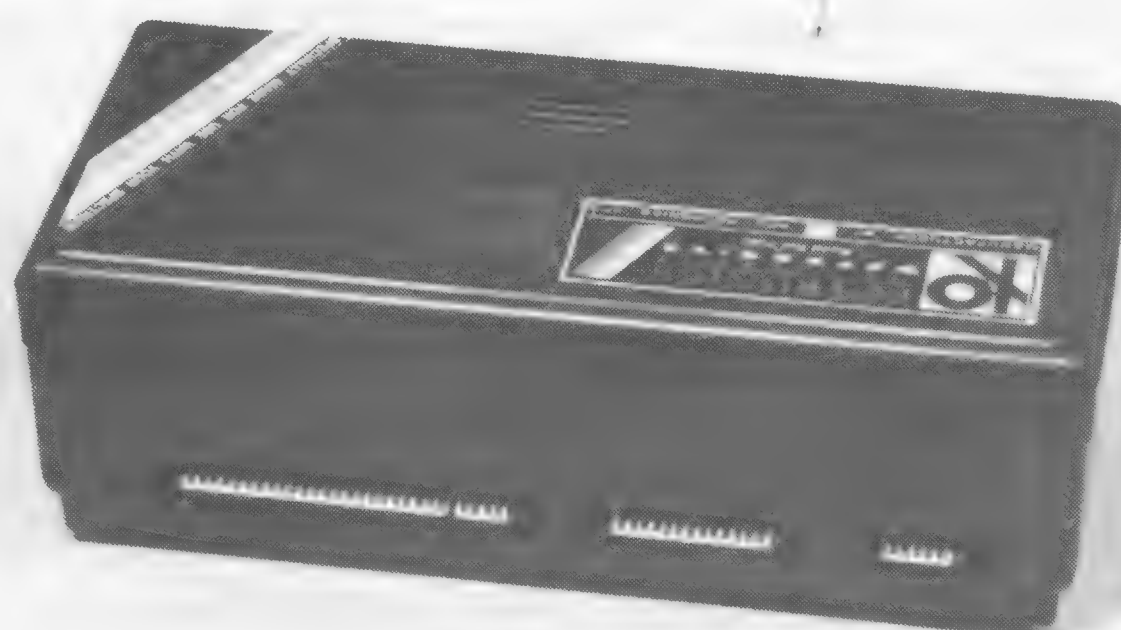
The Wafadrive plugs right in to a Spectrum or Spectrum Plus as it comes from the box. It can be interfaced to a TS 2068 using the Omni/Emu Spectrum Emulator (will not work with Romswitch or Spectrum Rom) and a Spectrum buss converter board. Connecting the system, at least to a Spectrum Plus, is very simple. Only the one connection to the back of the Spectrum edge connector is made. The Wafadrive draws its power from the Spectrum (or TS 2068) and needs no external power supply.

The back of the Wafadrive provides three outputs: a Spectrum compatible extension of the edge connector, a centronics parallel printer port, and an RS-232 serial port. Cables for the non-standard printer port connectors are available at a very reasonable price.

Once the Rotronics Wafadrive is connected and the computer is turned on, the regular opening screen shows the Sinclair



Front view of Rotronics Wafadrive. A Wafatape is inserted in the left drive.



Rear view of Wafadrive showing (l. to r.) edge connector, centronics port, and RS-232 port.

copyright notice. The computer functions like a normal Spectrum computer. To activate the Wafadrive Operating System, you type NEW *. After a very brief flicker of the screen, the screen shows that the operating system is in place. Now the fun begins.

CAT * #A (or B) will give a directory of the tape currently in drive A (or B) showing name of file, type of file, size of file, storage capacity of the wafatape, and storage space left.

To load a program, type LOAD * "a:filename" or simply LOAD *"" if the tape is in the default drive and has only one file on it. Saving is SAVE * "a:filename". The minimum size of a file is 1k so only 16 files maximum can be saved on the 16k tapes, and up to a maximum of 32 on the 64k and 128k tapes. Programs are transferred to or from tape at about 2k/second (18k baud) once the program is located by the Wafadrive. Maximum time to find a file is 45 seconds on the 128k wafers and 6.5 seconds on the 16k. The W.O.S. (Wafadrive Operating System) takes care of where to place the files and how many there are. Files do not have to be numbered as with the A & J drives.

New tapes must be formatted for use with the FORMAT * command. This is also useful for erasing a whole tape. Tapes can be protected from erasure by removing the write protect tab.

Other, more advanced work can be done with the file capabilities of the Wafadrive reminiscent of floppy disk systems. For example, random access data files can be written to and read off the wafatapes, and commands such as MERGE, MOVE, COPY, and VERIFY can be used.

The printer interfaces have their own software on built-in ROM so need no other software to work in Basic except the OPEN# command. They both support PRINT and LIST. The RS-232 can both send and receive at baud rates between 300 and 19,200. Pin-outs and sample programming applications are included in the manual.

The manual consists of a 68 page wire-ring-bound book about 5" by 5 1/2" in size. It has both a Table of Contents and Index, and is very well written and easily understood. Though not everything you might ever need to know is found in it, I suspect that enough information is there for you to figure the rest out.

Also included with the Rotronics Wafadrive System is one blank wafatape and a

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How much would you expect to pay for a dual 128K fast access storage system for your Timex 2068 that included Centronics and RS232 interfaces, Spectrum software and buss emulation, and free word processing software as standard?

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* The Omni/Emu cartridge is required to operate the Wafadrive system. The Wafadrive will not operate by just changing the ROM to the Spectrum ROM or by using the ROM switch.



A fast reliable dual-drive storage system

Integrated System

The Wafadrive is a complete system which contains the micro interface, two 128K drives, RS232 and Centronics ports, all in one attractively-styled, compact unit. There is a minimum of connecting leads and no extra boxes to clutter the desk top. Like the majority of professional systems, the units are dual drive. This offers the optimum balance between system flexibility and cost. Built-in serial and parallel interfaces allow the direct connection of just about any popular printer.

Fast and Reliable

The Wafadrive achieves very fast loading and saving, but not at the expense of reliability. Extensive research and the use of high grade materials ensure that the Wafadrive will give years of dependable operation. Data integrity is on a par with floppy disk. The fully inter-

changeable wafers are available in three sizes-128K, 64K and 16K. Low capacity wafers give faster access. They are therefore most suitable for program development applications. The high capacity wafers are suitable for more general data storage. Loading rate is approximately 2K per second-almost twice as fast as similar products.

Software

Armed with the com-

prehensive user manual, blank wafer and word processor supplied, you can use your Wafadrive right away. There is also a rapidly growing range of software to enable the programmer and games player to exploit the Wafadrive system to the full.

Spectrum Emulation

The Wafadrive includes the Omni/Emu Cartridge. This enables the Timex 2068 to run thousands of Spectrum

programs. The rear edge connection is compatible with Spectrum Hardware as well as allowing use of the 2040 printer.

Wafadrive for the Timex 2068 and the 16/48K Spectrum are available now. Versions for other popular home computers are under development.

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word processing program called Spectral Writer. Spectral Writer resembles and functions very much like Tasword Two in many ways. It offers 64 character screen, 352 line text capacity, automatic word-wrap and justification, page numbering and headings, tabs, very fast text entry, "bell" before line ends, programmable printer codes, etc. It comes with its own 39 page manual also well written and organized. Its advantages over Tasword Two are these: it's "free" with the system, faster keyboard response, tabs, auto page numbering and heading, and ability to change screen colors. Its biggest disadvantage seems to be that there is no way given to change the 64 column line length. In other words, all lines of text must be 64 columns, no more or less! This makes it unsuitable (unless someone has the patch or knows an undocumented command) for producing anything with narrower columns such as this magazine article.

The Wafadrive Operating System commandeers 2k+ of your computer's memory when it is booted up with the NEW * command. It confiscates this memory just above the System Variables area and below the Basic Programming area. As a result, some programs may not fit when using Wafadrives. Other programs, because they address specific areas of memory also may not be compatible with the Wafadrives. We will be able to report more later on which popular software does and does not fit. Rotronics claims to have a list of software that has been converted to the Wafadrives.

The American distributor of the Rotronics Wafadrive System is Damco Enterprises, 67 Bradley Ct., Fall River, MA 02720; 617/678-2110. Their retail price for the system for the Spectrum is currently \$165.95. Price for the TS 2068 version including Omni/Emu and buss converter is \$229.95. Printer cables, either kind, are \$12.95 each. Blank wafers are \$3-4 each. They also offer a number of games and other software on Wafatapes at very reasonable prices.

Are they worth the money? You will have to decide. For a little more money than the A & J Microdrive, you can get a two drive system with two printer interfaces and a word processor thrown in for good measure. The price is considerably less than the price of any of the single disk drive systems being advertised as of this writing. What would I do? I've already bought one!

-- Richard Cravy

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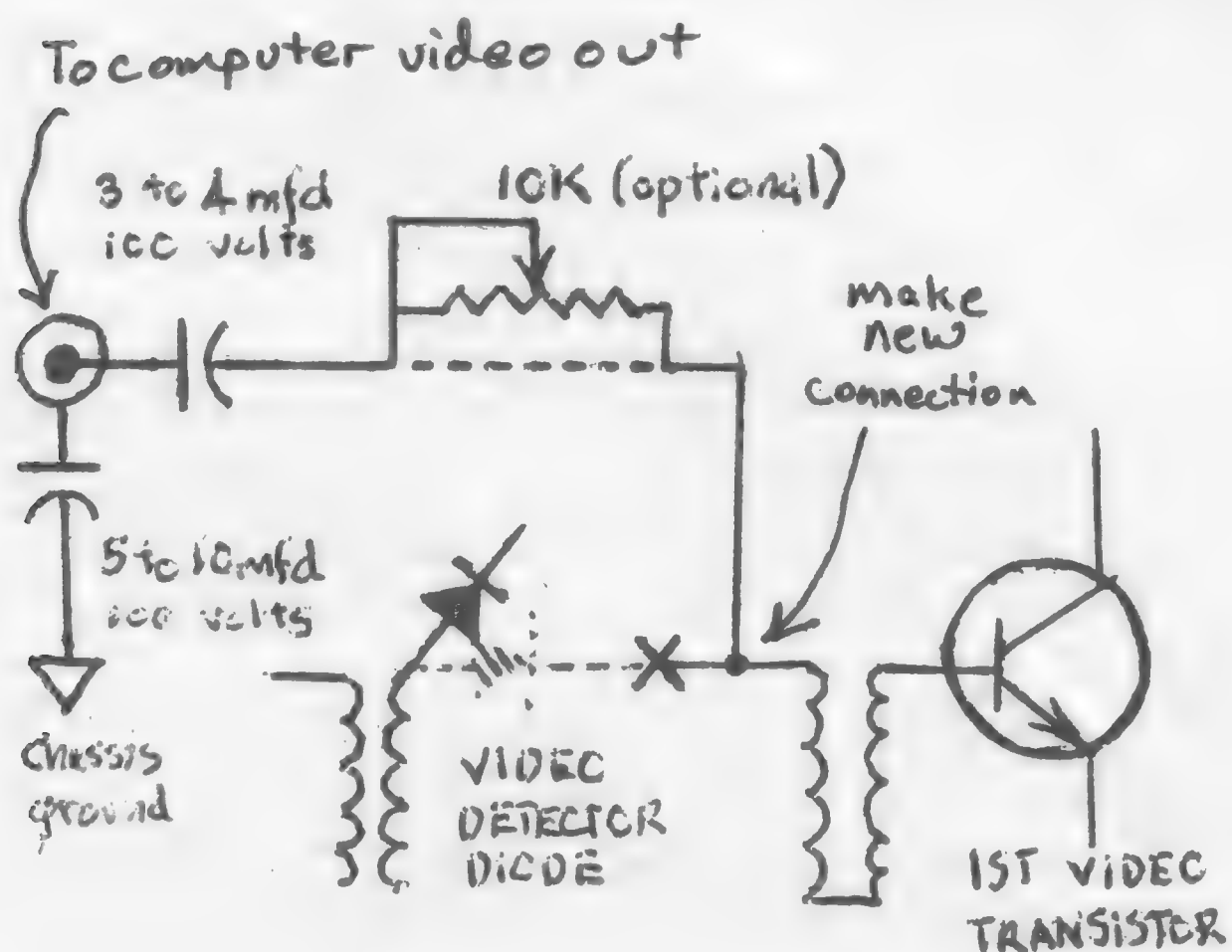
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Convert Your TV into a Computer Monitor

It's not too difficult to convert any B&W or recent color television into a direct-video monitor for your 2068. Being a T.V. technician by trade, I was not satisfied with the hashy-trashy display on my new computer since my old ZX-81 had a UHF RF modulator and put out a very clean picture. I found a 12" B&W transistor junker at the shop that only needed a fresh CRT, put in a tube from another abandoned set and converted it.

The most important fact about almost all T.V.'s today is that the CHASSIS GROUND IS NOT EARTH GROUND. In order to eliminate the necessity of an expensive power transformer, the chassis ground is A.C. ground and can have up to 117 volts A.C. potential to earth ground. This means we have to use capacitors for both ground and to couple video into the set. I found that 10 mfd was more than enough to eliminate any tearing in the video due to the lack of a real ground. Use 3 or 4 mfd. for the signal capacitor. I modified my set into a monitor only, but it is possible to add a switch to cut off one of the I.F. transistors and make a TV/monitor.



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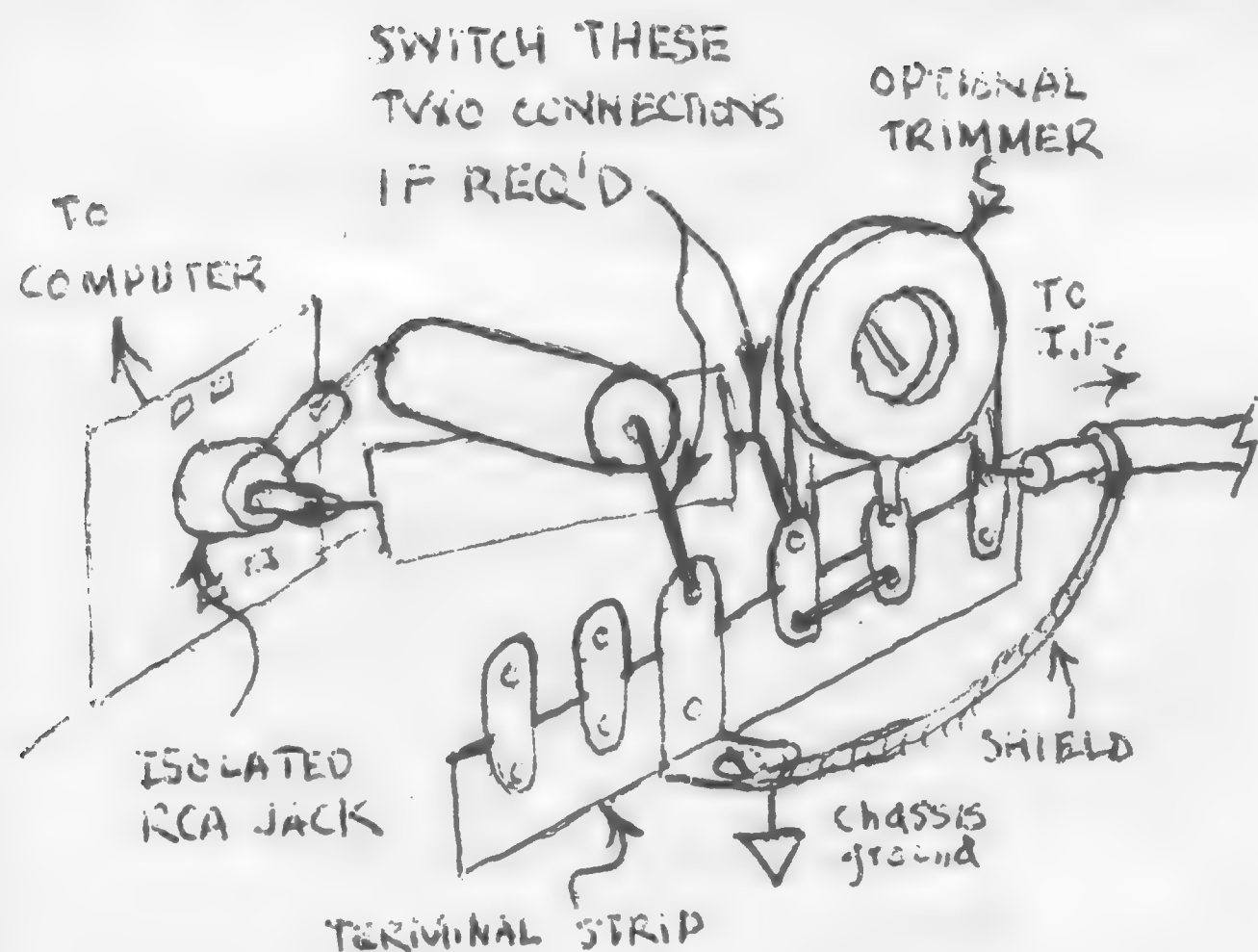
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Start out by using a schematic or other means and find the video detector diode and the first video transistor. The monitor output of your computer is injected after the video detector and before the first video amp. Mount an RCA jack installed in a plastic card next to a place where you can cut a hole in the cabinet. A cardboard template that fits over one of the controls that projects out of the back makes

locating the hole in the cabinet easy. Mount a terminal strip near the jack and run the two capacitors between it and the jack. Connect one between chassis ground and the outside of the RCA jack. Connect the other capacitor between the center of the jack and the center of the shielded cable. Run the shielded cable into the I.F. and solder the center in the hole left after you have pulled up an end of the video detector diode. After you make certain that both parts of the jack are isolated, it's time to switch your computer's cable from RF to the monitor jack and hook up the set and see clean direct video. Now, if the picture is negative and flipping, the fix is easy. Your set has negative video so just switch the connections of the coupling capacitors. If the signal seems to be too strong or there are double images; adding a 10K ohm trim pot should take care of it. On a color TV you can re-center the tint by using the proper adjusting tool on the burst transformer. If you're adjusting this transformer, then the slightest adjustment makes a huge difference in the tint. If the color is weak, the ACC/Killer trim pot will take care of that. I found that it's also good to disconnect the speaker and replace it with a 10 ohm 1 watt dummy load.

This conversion works for both B&W or color sets. I'm using the 12" set I modified right now to write this article. The display on it is as good as commercial monitors I've seen being driven by 2068s.

- John Monkus

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Pro/File 2068 Filing System

An Outstanding Value

When Tom Woods released PRO/FILE 2068 so long ago, it appeared to be quite a file system if you could figure out how to use all of its features from the meager instructions included with the program. We were all promised that a comprehensive manual was being compiled and would be shipped to all who ordered P/F as soon as it was available. So we waited, and we waited. Finally, after almost a year had gone by, it came! - it was worth the wait!

The program itself was a sleeping giant waiting for someone to master its power and complexities. The manual is an in-depth tutorial on its use, enhancements, and disassembly.

The manual describes the program as being like an "index card" file system with each screen of data (record or file) being a single card. Once the data is put in each record, you can order them alphabetically or numerically and call up any record of your choice just by entering the name in that record - as with the card file. P/F goes it one better by being able to pull up a record by any piece of information in that record.

For example: Suppose you have a mailing list with names and addresses and you want to bring up a record that had the word "NEW" in it but you can't remember where the word appeared in the address. You can simply enter the word "NEW" and P/F will go and look for any occurrence of the word "NEW" and display it on the screen. It may

bring it up as being in the name: I. NEWTON, or in the address: 112 VINEWOOD AVENUE, or in the city/state line such as: NEW YORK, NY 10009. I must note here that it is better to stay in caps mode so that there will be no mistake between "new", "New", and "NEW". P/F sees these all as different words.

The records are pulled up lightning fast, and once pulled up, you can change them, print them, or call up the next record with the same search command. Search commands can also be mixed so that you can ask for more than one parameter to be true before a record is displayed by separating each search command by the token "AND". In the previous example, suppose that we want to display all people living on "VINEWOOD" and also living in "NEW YORK". We would enter "VINEWOOD AND NEW YORK" in response to the SEARCH COMMAND? "C" prompt.

The main menu displays several parameters such as the number of bytes open (starts with 28000), the file name, the line in which ordering takes place, and the printer format (which lines are sent to the printer and in what order). The bottom of the screen contains the menu: Type "A" to add files, SAVE or LOAD for SAVEing and LOADING of files, AUTO for ordering the files and DEFP which allows you to alter the printer format.

Choosing "A" gives a blank screen with a blinking cursor in the top left corner and a sub-menu at the bottom. You can now enter anything you like in the 15 line by 32 column space provided. The arrow keys allow you to start anywhere you like and the sub-menu gives you commands to delete and insert lines and COPY to your printer. Also, you can edit existing files from this menu. You must remember to place the

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same type of information on the same line in each record so that the order command can always order the correct data.

Once you enter a file, you will notice there are spaces between the end of your data and the end of your line. Most databases would see these spaces as data and save it as part of the file along with the rest of the data in that file. That wastes a lot of valuable space. In P/F, those extra spaces are ignored. This of course allows much more data to be saved as compared to say, VU-FILE.

The manual goes into great detail on each function available and numerous examples are given to help you understand what is going on. The manual even explains how the program works in a step by step analysis of both the BASIC and machine code programming. Also included are numerous enhancements to make the program more useful.

Enhancements include: Saving a back up copy, adding verification, how to change a file name, how to clear your files, adding an audible tick to your keystrokes, saving paper by not LPRINTing blank lines, ordering by more (or less) than the first five characters, disable auto-repeat in add/edit mode, go directly to LPRINT from the edit mode without going through the main menu, go from edit to next entry without going to the the main menu, Autosearch improvement, block delete to purge specified files, and block sort to rearrange data.

Personally, I would have liked to have seen all these improvements included with the original, but I can understand how all these improvements would take away from the storage capabilities of 28000 bytes (or characters). A definite must for me are the "Go from edit to next entry without going to the main menu" and the "Autosearch improvement" enhancements.

Use of a "big" printer requires that you enter the code for your interface. Included is code for the Aerco, Tasman, and all Byte-Back interfaces. Also included is a "TALLY" routine which allows you to perform math functions and tabulation on data stored in files.

The only drawback that I could find is the speed at which it orders. As fast as the program finds things, I had hoped that the ordering would be at least as fast. With about 400 names and addresses in each file, it took about 30 minutes to order by Zip Code and print out. Otherwise, I was

very impressed with the friendliness of the program, its storage capabilities, and the way it handles files. Of course there are always improvements that you would like to add, and the manual's explanation greatly aids you in any such endeavor.

We had considered finding a new program to handle our SUM mailing list which would store more names and addresses. The data we had was stored in A\$ in a matrix format (200,25,5) and P/F uses d\$(28000). From the manual, I was able to determine that each file in P/F was separated by an asterisk, and each line was separated by a character code 1. With a short little program, I was able to convert my data over to d\$ and load it into P/F. You must make sure that d\$ is the first variable to be dimensioned. I now have all of our list

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on P/F and love it! We needed something along these lines to help update our mailing list and to order by zip code, which is required for bulk mailing.

We needed a few enhancements of our own to make it fit our needs a little closer. The first thing I added was the go from "edit" to next entry without going to the main menu and the autosearch improvement given in the manual. I found that it didn't work just right so I added or changed the following lines:

```
5015 LET Y$=INKEY$
5016 IF Y$=" STOP " OR Y$=" STEP
" THEN ON ERR RESET : GO TO 6
000
5020 FLASH 0: PRINT AT 1,c;SCREE
N$ (1,c):BEEP .0003,34: IF CODE
Y$<16 THEN GO TO 5100+CODE Y$
```

Note the BEEP command in the above line. This works much better than the enhancement given in the manual. Also, remove the FOR-NEXT loop at the end of line 5030. I don't know why its there, but it slows things down a bit. I also added the go directly to LPRINT enhancement. One of my own enhancements is the go from ADD a file to ADD another file without going to the main menu". To do this, add or change the following lines:

```
1 LET j=0
15 IF j=1 THEN GO TO 5000
5016 IF Y$=" STOP " OR Y$="NOT "
OR Y$=" STEP " THEN ON ERR RE
SET : GO TO 6000
6025 IF Y$="NOT " THEN LET J=1
```

When you are through adding one file and wish to add another, enter the token: "NOT " and you are immediately given a new file to fill instead of going through the

main menu first. This really saves time when you are adding a lot of new names to a mailing list.

For our application, we need to have only current subscribers print out on our mailing labels. To do this, I use the sixth line in the file as the date line which holds the expiration date of each subscription. 8512 means that December of this year is the last issue that will be received. To incorporate this into P/F, we need the current month and year to be entered and compared to the current file to be printed. Also, printer code must be entered to use a large printer. The following lines were added or changed:

```
1 LET j=0: POKE 26703,187: PO
ke 26704,248: INPUT "Enter today
's date (yymm): "M$
2 POKE 23658,8
7206 IF E$(4,1)<>X$(1) THEN GO
TO 7208
7207 IF E$(4,1 TO 3)=X$ THEN GO
TO 7210
7208 IF E$(6,1)=" " THEN GO TO
7230
7209 IF VAL E$(6,1 TO 4)<VAL M$
THEN GO TO 7230
```

When ordering of the zip codes is called, the program now checks to make sure that each name is up to date before it is printed. We now have a very usable program with enough power and storage to handle us no matter how big we get!

PRO/FILE 2068 is available from Thomas Woods, P. O. Box 64, Jeffersn, NH 03583; 603/586-7734. Price is \$29.95 + shipping. Phone orders are accepted with credit card.

-- Joe Williamson

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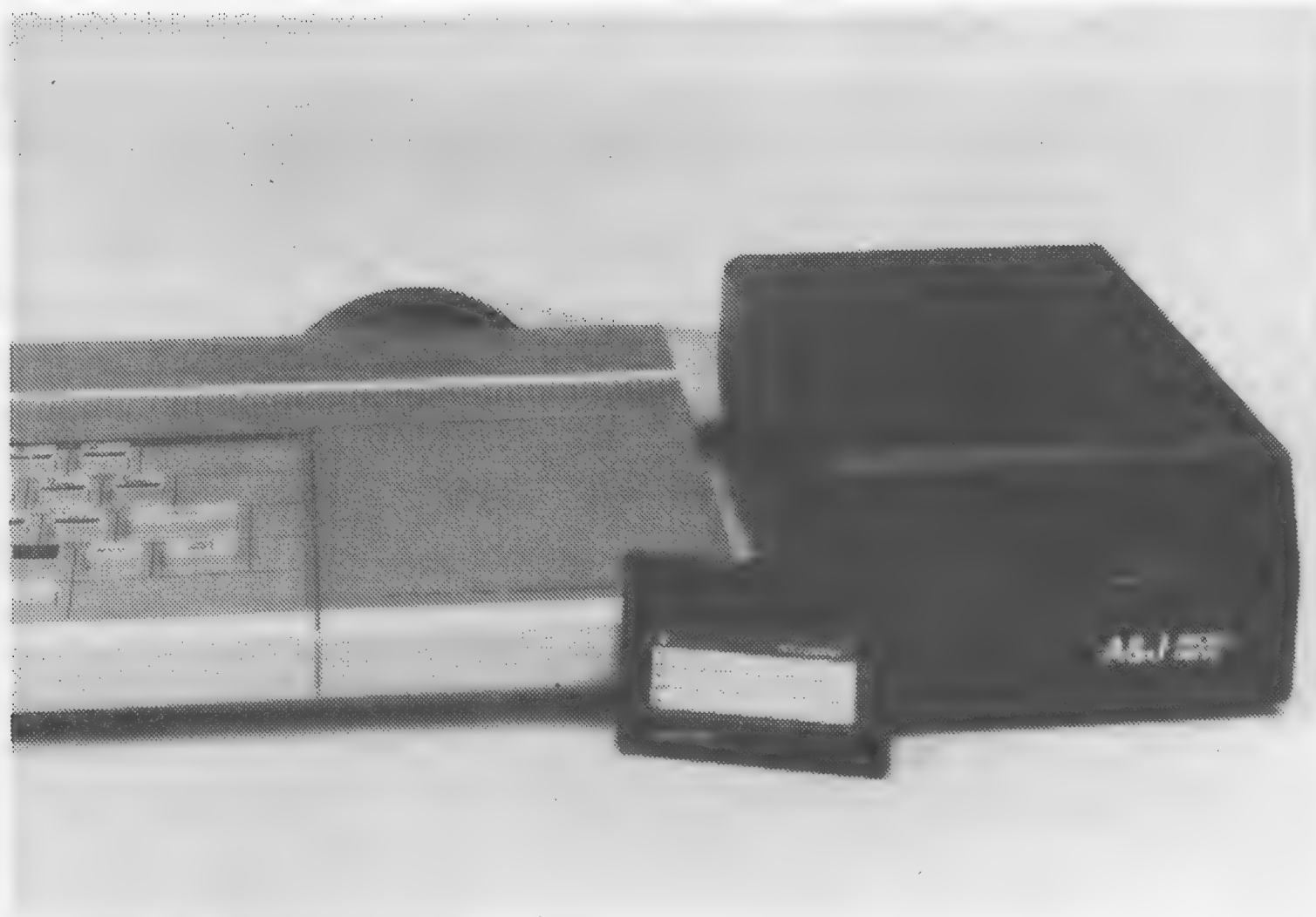
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900004	50' MICRO WAFER II _____	4.75
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Zaxxon, by U.S. Gold Spectrum Arcade Game

Zaxxon for the 48K Spectrum that is a duplication of the popular arcade game. It comes in a nice plastic package and looks much more "expensive" than a standard cassette case. On the front is a great picture of the game.

The documentation is pretty good and explains the game quite well. A person who has never seen Zaxxon before may have some trouble at first. The documentation also shows some of the other games that the same company supplies (they look great!). Also included is an offer to enroll in the "U.S. Gold Club".

The 3-D graphics in Zaxxon are very good. The space graphics, I think, are

even better than the original game. The only problem I have is telling exactly how high the ship is, and that can be quite difficult when you come upon a wall or force field!

The only bad point about Zaxxon is the speed. It is not smooth at all. In fact, the movement seems to be in "jerks". The movement gets faster when there are less objects on the screen. When dueling with the other jets in space, the movement slows more with each additional jet to fight. This is the only drawback to the game.

Zaxxon can be played with the keyboard or joysticks. The game allows programming any of the keys for movement. Once you find the keys that feel the best, you can really get into the game!

Zaxxon is fun and quite playable, so you arcade buffs will have a very good time with this one, and at \$17.95, it's a steal!

-- Doug Gangi

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FOOTE SOFTWARE

P. O. Box 14655 — Gainesville, FL 32604-4655
904/462-1086 6-9 p.m. EST

User Defined Graphics for TS-1000, Part II

Here is the program for the TS-1000 which will generate and store your own characters into the custom graphics board as described in last month's issue:

```

10 REM *** CUSTOM CHARACTER GE
NERATOR ***
20 REM
30 REM
100 LET B=0
105 PRINT AT 18,0;"INPUT CHARAC
TER TO BE REPLACED"
110 INPUT E$
115 LET C=7680+(CODE E$)*8
120 PRINT AT 18,0;"

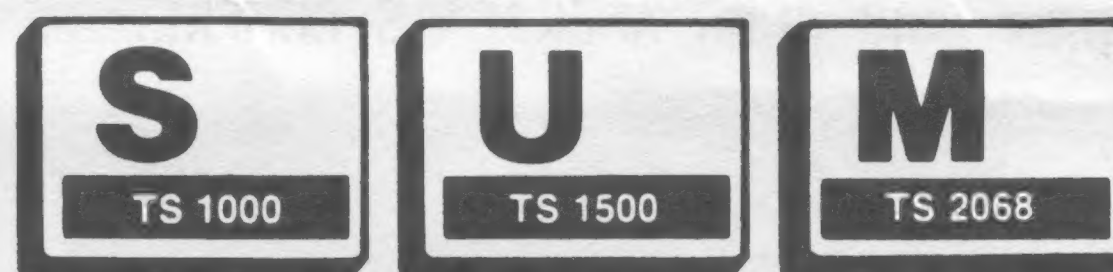
125 PRINT AT 20,B;E$
130 LET B=B+1
135 FOR X=3 TO 10
140 PRINT AT X,11;"██████████"
145 NEXT X
150 LET Q=(PEEK 16396+256*PEEK
16397)+144
155 LET Y=0
160 POKE Q,172
175 REM
300 PRINT AT 12,0;"USE ARROW KE
YS TO MOVE █, USE ENTER TO SET
A DOT (ABOVE THE █)"
310 PRINT AT 14,0;"TO DELETE A
DOT, MOVE CURSOR OVER DOT, TO
STORE A CHARACTER, PRESS Z"
400 IF CODE (INKEY$)=36 THEN GO
SUB 500
410 IF CODE (INKEY$)=34 THEN GO
SUB 600
420 IF CODE (INKEY$)=33 THEN GO
SUB 700
430 IF CODE (INKEY$)=35 THEN GO
SUB 800
440 IF CODE (INKEY$)=118 AND PE
EK (Q-33)=8 THEN POKE (Q-33),128
450 IF CODE (INKEY$)=63 THEN GO
TO 1000
460 GOTO 400
470 REM
500 REM * MOVE CURSOR RIGHT *
510 POKE Q,8
520 IF Q-Y>205 THEN POKE Q,0
530 IF PEEK (Q+1)=8 OR PEEK (Q+
1)=128 OR Q-Y>230 AND Q-Y<238 TH
EN LET Q=Q+1
540 POKE Q,172
550 RETURN
560 REM
600 REM * MOVE CURSOR DOWN *
610 POKE Q,8
620 IF Q-Y<230 THEN LET Q=Q+33
630 POKE Q,172
640 RETURN
650 REM
700 REM * MOVE CURSOR LEFT *
710 POKE Q,8
720 IF Q-Y>205 THEN POKE Q,0
730 IF PEEK (Q-1)=8 OR PEEK (Q-
1)=128 OR Q-Y>231 THEN LET Q=Q-1
740 POKE Q,172
750 RETURN

```

```

760 REM
800 REM * MOVE CURSOR UP *
810 POKE Q,8
820 IF Q-Y>230 THEN POKE Q,0
830 IF PEEK (Q-33)=8 OR PEEK (Q
-33)=128 THEN LET Q=Q-33
840 POKE Q,172
850 RETURN
860 REM
1000 REM * CHARACTER LOADER *
1010 PRINT AT 18,0;"...CHARACTER
IS BEING LOADED..."
1020 LET U=198+Y
1030 LET A=Y-33
1040 FOR X=A TO U STEP 33
1050 LET T=7
1060 LET S=0
1070 FOR O=0 TO 7
1080 LET M=PEEK (X+O)
1090 GOSUB 2000
1100 NEXT O
1110 POKE C,S
1120 LET C=C+1
1130 NEXT X
1140 POKE Q,0
1150 GOTO 105
1160 REM
2000 IF M=128 THEN LET U=2*(T)
2010 IF M=128 THEN LET S=S+U
2020 LET T=T-1
2030 RETURN

```



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—Fred Blechman, K6UGT

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Vendor Report

Timex-Sinclair "Survivor buttons" are now available from The White Church Cabin, 219 White Church Rd., Brooktondale, NY 14817. The buttons are full sized, 3-color and say: "SURVIVOR - Low cost computing," and have the Timex-Sinclair logo as well.

A & J Microdrive is now supplying the 1000 type micro drives and wafers on their Model 2000 microdrive. (Early 2000s had a different drive similar to Rotronics.) The older type drives are just as reliable and the wafers are more readily in supply. They are also shipping the printer cables and driver software for the printer port. 1050 "I" East Duane Ave., Sunnyvale, CA 94086 (408) 732-9292

Programming Tip

What does the following line do?

```
10 IF A$="YES" THEN LET X=1: P  
RINT "You pressed YES": STOP
```

At first glance, it would appear that whenever the computer came across this line, it would check to see if A\$ is "YES". If not, it would not make X=1 and then because it is a multi-line statement, it would print the message and then STOP. NOT SO! Due to the nature of the operating system, the statements following a conditional check will only be executed when the IF - THEN statement is true. No more "go to a subroutine" is needed when you want to do more than one thing when a condition is true. Just put them after the check in a multi-statement line format!

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PUBLISHER'S STATEMENT, continued from p. 2
many of them have higher expenses than we do. We wish them the best, and recommend that users subscribe to as many as possible.

We welcome submissions for publication. We do not guarantee to publish it, but we will look at it, and determine if it fits in with our editorial needs. Also, we are willing to pay for both articles and programs submitted according to the schedule printed in each issue of SUM. "Willing" is the key word here, as we leave it to the author's initiative to tell us if he wants to be reimbursed; if nothing is said, we assume it's gratis.

-- Richard Cravy

FOR SALE

SUM Magazine has two COLOR composite video monitors for sale. They are in near new condition and have been used for testing and reviewing hardware/software in SUM. One is an Amdek Color 300 13" originally selling for \$350; the other is a Texas Instruments 12" which once sold for \$400. Both are 2068 compatible. Either can be purchased for \$180 including shipping. Call Joe Williamson at 904/462-1086 for availability and more information.

Gainesville TUG Meetings

The Gainesville Timex Users Group has changed its meeting time and place. Meetings are now the third **Tuesday** of each month in the northeast classroom area of the **Crossroads Church** building located at 2720 SW Second Avenue in Gainesville. Meeting time is still 7:00 p.m. These facilities are somewhat larger than what we have used in the past and can accommodate a number of computer set-ups. TUG thanks Skipper Electronics for their long time support of Timex computers in Gainesville and for letting us use their store as a meeting place since our beginning in 1983.

Our May meeting was very exciting, with both the Portuguese disk drive system and the Rotronics Wafadrive system available for everyone to look and try out. Anyone needing more information about the next meeting can call Joe Williamson at 904/462-1086 or Richard Cravy at 904/378-9000 for more information.

